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# A Design and Development Approach to Researching Online Arabic Vocabulary Games Learning in IIUM

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## Abstract

This paper describes the design and development process of an online Arabic vocabulary games learning prototype for elementary learners at the Centre for Foundation Studies (CFS), International Islamic University Malaysia (IIUM). The effort to produce this learning prototype is an attempt to integrate game-based learning in an online environment, to provide new learning experience for learners who have been through a traditional Arabic teaching and learning methods, and to collect and analyze their feedbacks and responses as the formative evaluation of the prototype. The exploration of the game-based learning prototype potential for use in teaching and learning in real setting by learners and teachers is also among the steps taken to evaluate the practicality of the prototype.

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## 1. Introduction

Game-based learning (GBL) is a new model of e-learning which has its potential in teaching and learning (Prensky, 2001; Squire, 2005, et. al). The term GBL describes the teaching and learning process by computer games similar to other terms such as digital game-based learning (Prensky, 2001) and edutainment & 'serious games'. (Tsai F.H., et. al, 2008). Somehow, 'serious games' differ from edutainment games in terms of more advanced design consideration, latest hardware and software and rules of simulation (Michael & Chen, 2006). The online mode is used for this prototype because it allows learners regardless of their geographic location to participate independently in the learning environment (Connolly & Stansfield, 2006). It is played on a computer platform which has the internet connection; the

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games are stored and played directly from the server (Roslina & Azizah, 2008). An online platform is also chosen for the games. Prototype to facilitate the usability and easy-access of this application for the Arabic language learners.

## 2. Design and Development Methods

The design and development of games is not an easy process. It requires extensive programming from the development of game engine, middleware, interface programming, audio programming and so on. However, a number of easier tools such as some functional authoring tools and drag and drop interface. (Roslina & Azizah, 2008) have been recently developed,. The design and development process of Arabic games prototype described in this paper is an integration of Arabic learning contents from the traditional learning aid of text book with the Raptivity e-learning authoring software which comprise a multitude of game templates. The selection of this software is due to several reasons such as its supportive features for the correct display of Arabic fonts and Arabic writing system from right to left. It is also a tool that can be easily used by educators without the needs of high level computer skills, which is a common problem faced by the Arabic language teachers (Mohd Feham & Isarji, 2006; Mohd Feham, 2006; Zawawi, 2008).

The design and development of the Arabic prototype are based on the methods and approaches of design and development research (Richey & Klein, 2007), which was formerly known as developmental research (Richey, Klein & Nelson, 2004). This method is also known as designed case (Reigeluth & Frick, 1999), design-based research (Reeves, 2006 & Herrington, et. al, 2007), formative research (Nieveen, 2007), design research (Bannan-Ritland, 2003; Van der Akker, 2007) and many more. Although many terms have been used to explain and describe this research method within its similarities and differences, it signifies an extension to other educational research methods to test theory and validate its practices. (Richey & Klein, 2007) as was first proposed by Brown & Collins in the 1990s.

Design and development research or design-based research methods focus on designing and exploring the whole range of designed innovations: products, artefacts and models as well as less concrete aspects such as programmes, activity, scaffolds, and curricula. As suggested by Bell (2004),

Design-based research with its focus on promoting, sustaining, and understanding innovation in the world should be considered a form of scholarly inquiry that sits alongside the panoply of canonical forms ranging from the experimental, historical, philosophical, sociological, legal, and the interpretive.

The main research goal is to develop instantiations or approaches for solving human teaching and learning while at the same time, construct a body of design principles that can guide future development efforts (Reeves, 2000). It integrates both a theoretical orientation and pragmatic goals relevant to practitioners, as aptly put by Anderson (2004:8)

...unlike many forms of qualitative research, it goes beyond understanding the context from participants' perspective to actively working with participants to improve, assess and re-design the critical educational context in which learning happens. ...Not only does development research warrant an active approach to design, redesign and investigating constructs that are relevant to the researcher, learners and instructors, it surpasses the action research genre that tend to ignore theoretical development or implications.

Table 1. illustrates the elements of a design and development research.

Table 1. Elements of a developmental research

Goals	Dual goals – theory and practice
Theory development	Multidisciplinary and interdisciplinary
Method	Mixed modes
Process	Cyclical, iterative, teamwork
Resources	Extensive literature, Collaboration, partnership, various research technologies
Outcomes	Improved theory, product, design principles

Adapted from Nor Aziah Alias (2007)

### 3. Design and Development Model, Process and Phases

The design and development principles of the Arabic online vocabulary games were built based on 5 levels of games learning which Prensky (2001) refers to as: **”How,” “What,” “Why,” “Where,” and “When/ Whether”** levels at which video and computer games learning occurs (Pivec, Koubek & Dondi, 2004, pg 42). Several frameworks and models have been proposed by researchers in the field of game design such as The Design Framework for Edutainment Environment by Embi (2005), Adopted Interaction Cycle for Games by Barendregt & Bekker (2004), Game Object Model by Amory (2001) and The Engaging Multimedia Design Model for Children by Said (2004), as cited in Tan, Ling & Ting (2007).

The process to construct the design and development framework for the Arabic online vocabulary games prototype begins with the analysis of theories from literature based on the work of Nation (2003), Prensky (2001) and Mayer (2001). An extensive review of literature coupled with a 9-year personal teaching experience of the researcher and several findings on the reasons of failure in Arabic subjects among learners in 4 consecutive semesters of 2005/2006 until 2008/2009 contribute to the needs analysis. Based on the researcher’s early analysis and observation, the current lack of instructional technologies in teaching and learning Arabic has caused the problem of memorizing the content of Arabic lessons taught in the classroom, as discussed by Ghalib (2006) and Zawawi (2008). While the reports of students’ failures revealed that among the main and obvious factors were poor attendance in the classroom, weakness in memorizing Arabic vocabularies and their minimal effort to improve and pay attention to Arabic language learning. These factors were mainly related to students’ learning attitude and motivation in learning Arabic.

In addition, the ADDIE ( Analysis, Design, Development, Implementation, Evaluation) model is chosen as the instructional design model for the research as it fits the design and development methods, objectives and approaches to produce a full picture and understanding of an online vocabulary learning module theoretically and practically. Walter Dick and Lou Carey are widely viewed as the torchbearers of the ADDIE methodology, in their book of *The Systematic Design of Instruction* (Dick & Carey, 1996).

In addition, Akilli (2004) has proposed the FID2GE model consisting of four phases of design, which are analysis, design, development and evaluation. FID2GE stands for **“Fuzzified Instructional Design Development of Game-like Environments”** for learning which he claims as derived from the dynamism, non- linearity and the fuzziness (p. 139-142) of games as shown in Figure 2.0 below.

However, for the design and development of the Arabic online game module, the researcher opts for ADDIE’ instead of FID2GE because of the uncertainty of the implementation phase and the existence of five (5) main phases in ADDIE that facilitate facilitate the research. The argument of whether ADDIE is a model or just a process is not the objective of discussion in this paper.

The ADDIE model is chosen for its systematic generic approach in instructional design, which clarifies the instructional framework to the designers or researchers in order to ensure the effectiveness of instructional products with creative processes. (College Station, 2001). The iterative cycles of the five (5)

phases of analysis, design, development, implementation and evaluation used in this project are used within the ADDIE Model as shown in Figure 3.0:

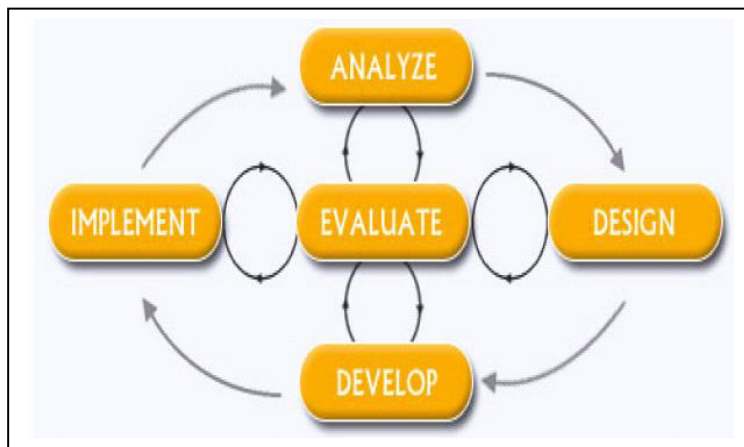


Fig.1. Iterative Cycle Of ADDIE Model

The front-end analysis for the learning needs of design and development of this prototype then was conducted based on the design and development of product and tool research (Richey & Klein, 2007) or previously known as Type 1 of developmental research (Richey, Klein, & Nelson, 2004). The differences between TYPE 1 and TYPE 2 of the research are as shown in Table 2.0 below:

#### 4. Refinement of Design and Development Theories

The refinement of theories from the literature in the *iterative cycles of testing and refinement of solutions in practice* (Reeves, 2006 & Herrington, 2007) begins at the front-end analysis phase which is used to analyze four (4) components of needs analysis in order to refine the feedback (Richey et al., 2004) with the theories from the literature as shown in Figure 4.0. The participants involved were all the students studied Arabic language in semester 3, 2008/2009 and the lecturers as well who were asked to answered the needs and pre-design survey of an online Arabic vocabulary games in CFSIIUM. The validation of the instrument was done by a lecturer from Institute of Education (INSTED, IIUM) who is teaching the subject of Research Methodology in IIUM.

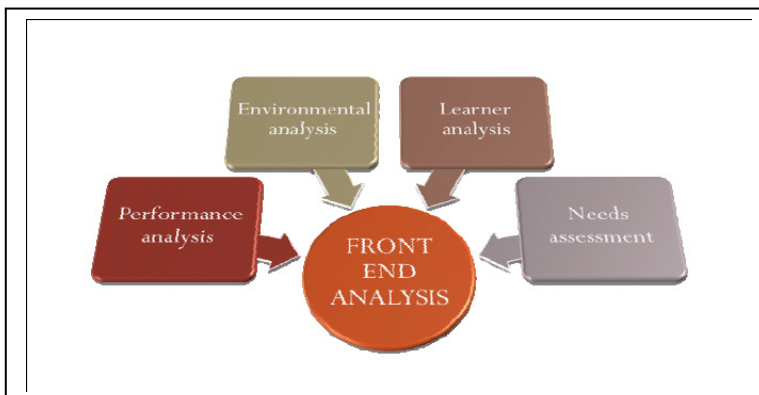


Fig.2. The Analysis Procedure in Developmental Research

The initial design principles from the analysis phase were discussed with by an expert from Arabic language lecturer from Centre for Language and Pre-University Academic Development (CELPAD) of IIUM in order to refine the contents of Arabic language to be integrated in the online games. The theories were also refined by an expert from Centre for Professional Development (CPD) of IIUM who specializes in instructional design and teaching using technology. At the end of this phase, the design and development principles were established to guide the development process.

## 5. Development of an Online Arabic Games Prototype

The development of online Arabic vocabulary games learning prototype is based on the design principles and built into vocabulary games templates from Raptivity e-learning authoring tools for the online learning environment. The researcher is the main designer and developer of this prototype learning module. It is however, the nature of developmental research that the researcher collaborates with a development team. Relevant tools of development are employed and the development process is documented in works logs as illustrated in Table 2.0..

Table 2. Works Logs of Development Process and Phases

Phase	Work Log	Descriptions
Phase 1	Designing the online games storyboards.	Designing the storyboards based on Design Theory Principles in Table 4.20.
Phase 2	Designing the webpage.	Designing the webpage for the online vocabulary games learning.
Phase 3	Developing the vocabulary games.	Developing the games by integrating the learning contents into the games design templates of Raptivity.
Phase 4	Uploading and publishing the games website.	Uploading and publishing the website in the IIUM server and testing the application.
Phase 5	Conducting formative evaluation session 1.	Conducting first formative evaluation of the online Arabic vocabulary games with expert reviewers and pilot testing.
Phase 6	Revision of design and development process and principles	Revising and modifying the development process based on experts' reviews and pilot testing.
Phase 7	Conducting formative evaluation session 2.	Conducting second formative evaluation of the online Arabic vocabulary games with students and teachers as the actual users.
Phase 8	Data analysis and report	Conducting the data analysis and report of the design and development process

## 6. Interface Design of Online Arabic Vocabulary Games Prototype

The online vocabulary games were hosted in a web-based environment as a teaching and learning aid in Arabic vocabulary learning.



Fig.3. Main Page of Online Arabic Vocabulary Learning Website

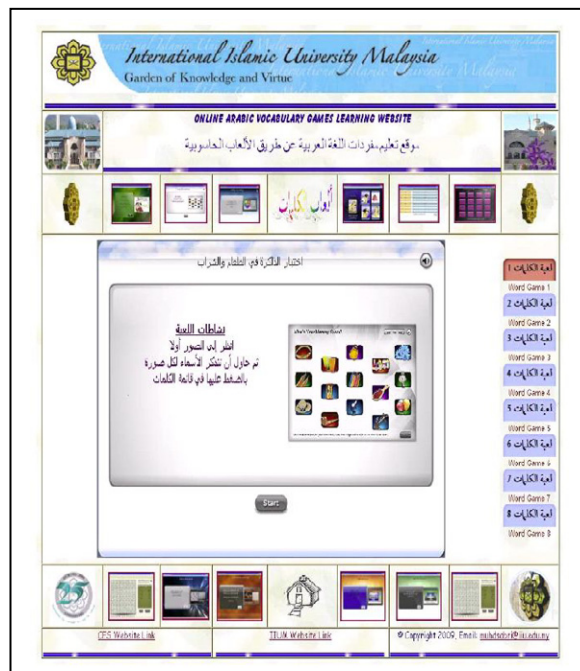


Fig.4. Screenshot of Online Arabic Vocabulary Learning Website



A limitation of the prototype is that it is specifically designed for Arabic learners for elementary level only based on the selection of vocabulary games, which may not be suitable for higher level of learning.

## 7. Formative Evaluation of Design and Development Principles

Formative evaluation as defined by Tessmer (1993, pg 11) is a judgement of the strengths and weaknesses of its instruction in its developing stages, for purposes of revising the instruction to improve its effectiveness and appeal. This evaluation is divided into 2 phases of game prototype 1 and game prototype 2. The validation of the instruments for formative evaluation was done by an expert in instructional designer and game-based learning from University of South Dakota from United States of America (USA). The process of consultation, discussion and validation is conducted via email.

The formative evaluation for prototype 1 will comprise try-out sessions with a limited number of the user groups such as teachers and learners who will use the product. In addition, expert appraisal or review from groups of experts such as subject matter experts, instructional design experts, and teachers will also make up the formative evaluation. (Nieveen, 2007). Prototype 2 will undergo four (4) types of formative evaluation which are expert review, one-to-one evaluation, small group test and field test. (Tessmer, 1993, pg. 15).

The formative evaluation of each prototype is illustrated in Table 3.0 below:

Table 3. Phases of formative evaluations

After User Testing of Games Prototype 1	
Participants and Methods	Instruments
<ul style="list-style-type: none"> <li>• Experts' review</li> <li>• (Instructional Designer &amp; Arabic Language Experts)</li> <li>• Peers' review</li> <li>• Pilot testing with students</li> </ul>	<ul style="list-style-type: none"> <li>Open-ended questionnaires</li> <li>Interviews</li> <li>Think-Aloud protocols</li> <li>Content Analysis</li> </ul>
After User Testing of Games Prototype 2	
Participants and Methods	Instruments
<ul style="list-style-type: none"> <li>• Instructor 1 to 1 evaluation</li> <li>• Student 1 to 1 evaluation</li> <li>• Small group evaluation</li> <li>• User testing (field test)</li> </ul>	<ul style="list-style-type: none"> <li>• Survey</li> <li>• Open-ended questionnaires</li> <li>• Interviews</li> <li>• Think-Aloud protocols</li> <li>• Class Observations</li> </ul>

## 8. Challenges and Obstacles

Design and development research provides an alternative to conduct rigorous and systematic design research based on solid theoretical foundations. The advantage of indulging oneself in a development research stems from being involved in conceptualizing the design and developing a new product that is functional and can be improved on. The development research activities that encompass preliminary investigation, theoretical embedding, empirical testing and documentation, analysis and reflection of outcome and processes (Van Den Akker, 1999) contribute to a much fulfilling experience. However, each endeavour is not without its own challenges and barriers. As part of the research process, the researcher documents his own reflection of outcome and processes. The challenges and obstacles described next

were derived from the researcher's experience during the design and development of the online games prototypes.

1. The limitation of technical support in this Raptivity software towards Arabic writing systems and fonts still exists, and has caused some restrictions of using Arabic conveniently, especially the display of Arabic fonts with the vowel sounds.
2. The limitation of games design templates in this software has also restricted towards the design of language games with advanced features such as displaying overall scores for all players for the purpose of competition, more choices of attractive games templates, colours, buttons, etc.
3. The financial implication is one of the restrictions to produce a high technology games in this study which has pushed the researcher to use the Raptivity software as a platform to develop Arabic vocabulary games.
4. This software can be used by all educators with a proper training and briefing without the need to have a high level of computer skills such as competency in using advanced authoring software to develop games such as Adobe Flash, Swish Max, and so no. Thus, this software could not be used to develop the advanced features of language games.

## **9. Lessons learned and Suggestions for Educators and Instructional Designers**

1. The technical limitation of this software towards Arabic writing systems and fonts should be improved and enhanced in order to make it more compatible, convenient and user-friendly with Arabic learning application.
2. The limitation of games design templates in this Raptivity software also can be upgraded and enhanced with advanced features such as displaying overall scores for all players for the purpose of competition, more choices of attractive games templates, colours, buttons, etc.
3. This future research and study of using game-based learning in Arabic language should include the design and development of games that use different learning platforms from this study such as arcade, console, CD-based and handheld or mobile learning games (Roslina and Azizah, 2008).
4. The educational institutions that offer Arabic language learning should play more active role in producing the attractive and interactive teaching and learning aids in order to enhance students' motivation and attitude in learning process and improving their achievement and performance.
5. The Arabic language teachers and practitioners should be more aware and knowledgeable with the latest teaching technology and computer skills. Some groups with high computer skills among them can be trained periodically in a cluster training for instance in order to help them producing new teaching and learning aids in Arabic language.
6. There should be sessions of cooperative work and research activities between language teachers such as Arabic, English or other languages with the instructional designers and computer experts to design and develop the advance and effective games for teachers and learners.
7. Other ID models may be used in the design and development of games based on the objectives, structures, expected outcome, technology or others issues based on the suitability and purpose of games design and development.



## 10. Summary

This paper has described an effort to design and develop an online Arabic vocabulary games learning prototype in IIUM. It is not within the scope of the paper to discuss the formative evaluation findings or the design principles of the Arabic online game. The process is still on-going in the real setting and hopefully the outcome of this project will enhance the process of teaching and learning Arabic language in IIUM and other institutions as well. Once completed, the research will also contribute to a refined set of design and development principles for an online Arabic vocabulary games learning specific to the Malaysian context and for non-native Arab speakers in general.

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